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42

MEMOIRS OF THE ARCHÆOLOGICAL SURVEY OF INDIA

No. 57

The "Numeral-Signs" of the Mohenjo-Daro Script.

BY
ALAN S. C. ROSS, M.A. (Oxon.),
Leeds University.

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DELHI: MANAGER OF PUBLICATIONS
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EXPLANATION OF PLATE XLII

Figs. 1-8 are slightly reduced direct photographs, while Figs. 10, 11 are of natural size.

Figs. 1, 2. Dorsal and ventral views of the cuttle-bone, *Sepia aculeata* d'Orbigny, from the Andamans in the Indian Museum.

Figs. 3-8. Dorsal and ventral views of three cuttle-bones from Othmanjo-Buthi (Ot 51, 63).

Fig. 9. Fragmentary right ramus of the lower jaw of a young *Bos indicus* Linn. from Jhangar (Jh, *a*).

Fig. 10. Fragment of the skull of a Domestic Goat—*Capra aegagrus* Gmelin race *indicus* Prashad, with Pm 3 and M_1, M_2, from Pokhran Landi (Pl 35).

Fig. 11. Right second upper molar tooth of the Domestic Goat—*Capra aegagrus* Gmelin race *indicus* Prashad, from Jhangar (Jh, *b*).

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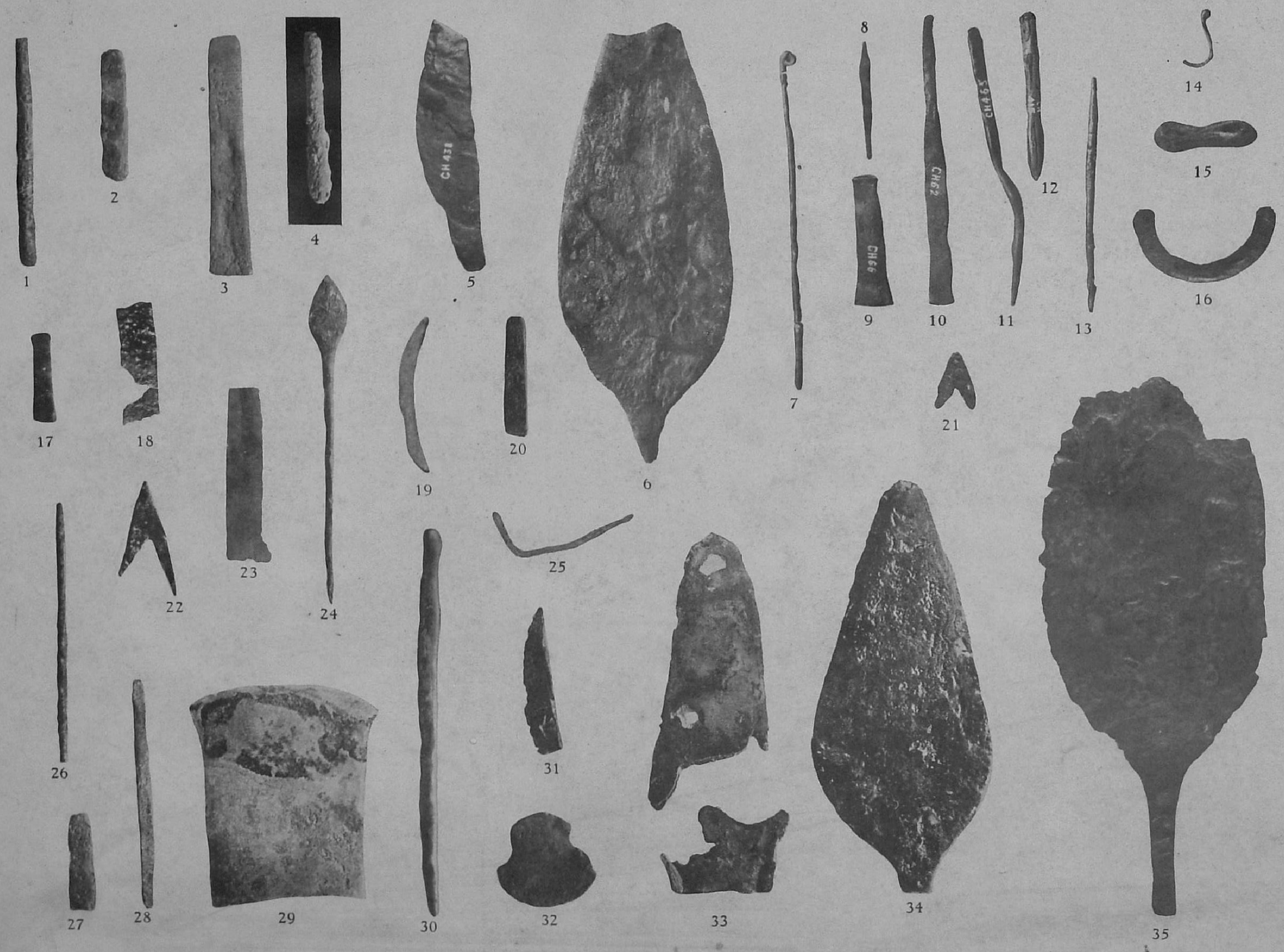
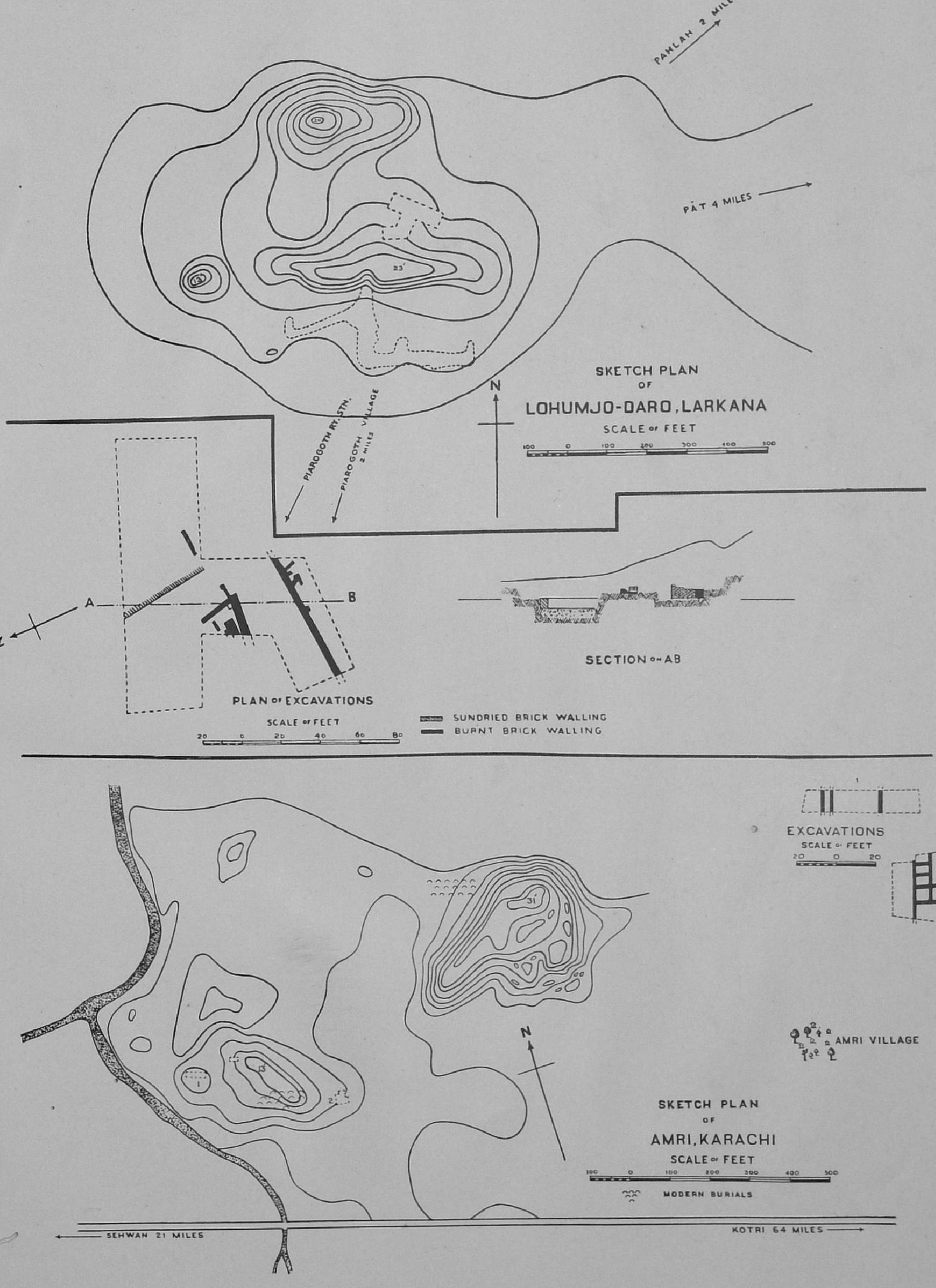
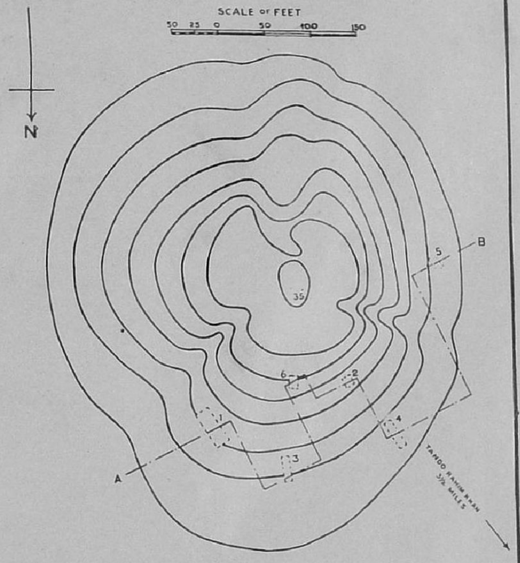


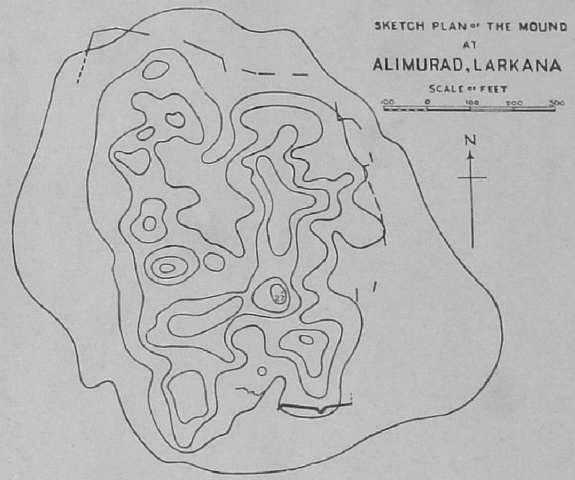
ANIMAL REMAINS


PAMLAH 2 MILES
PĀT 4 MILES
SKETCH PLAN
OF
LOHUMJO-DARO, LARKANA
SCALE OF FEET
100 0 100 200 300 400 500
N
PIAROGOTH RY. STN.
PIAROGOTH VILLAGE 2 MILES
A
B
N
SECTION ON AB
PLAN OF EXCAVATIONS
SCALE OF FEET
20 0 20 40 60 80
SUNDRIED BRICK WALLING
BURNT BRICK WALLING
EXCAVATIONS
SCALE OF FEET
20 0 20
AMRI VILLAGE
N
SKETCH PLAN
OF
AMRI, KARACHI
SCALE OF FEET
100 0 100 200 300 400 500
MODERN BURIALS
SEHWAN 21 MILES
KOTRI 64 MILES

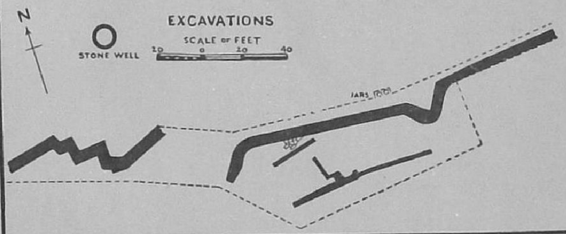
SKETCH PLAN OF THE MOUND
NEAR
GHAZI SHAH, LARKANA



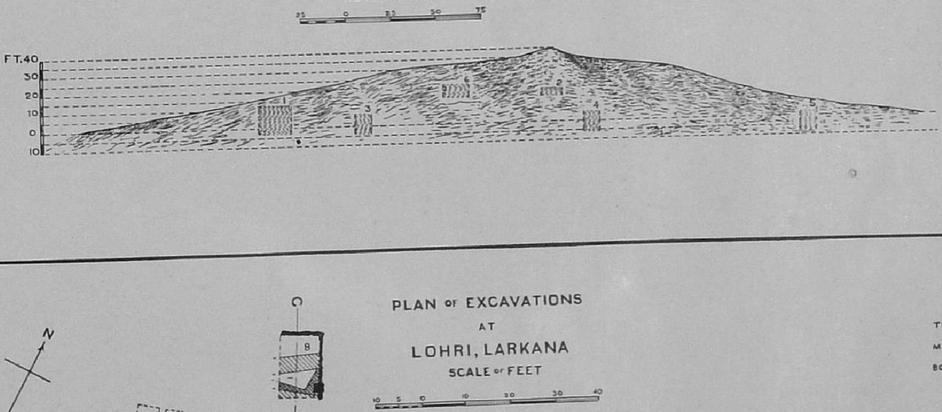
SKETCH PLAN OF THE MOUND
AT
ALIMURAD, LARKANA



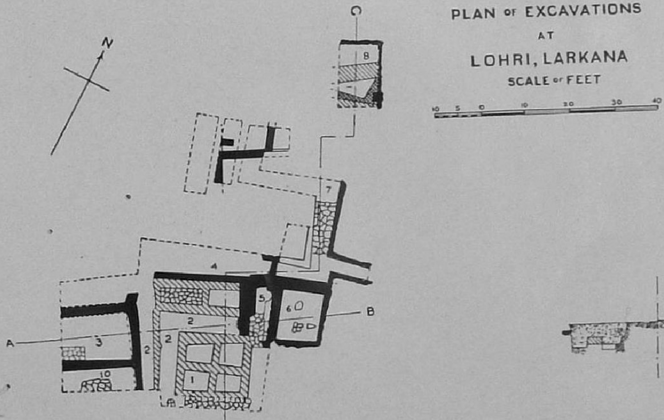
EXCAVATIONS



GHAZI SHAH
SECTIONAL VIEW

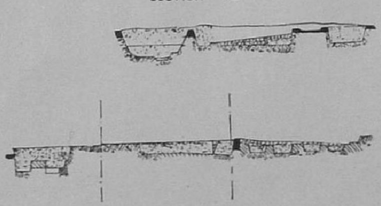


PLAN OF EXCAVATIONS
AT
LOHRI, LARKANA
SCALE OF FEET

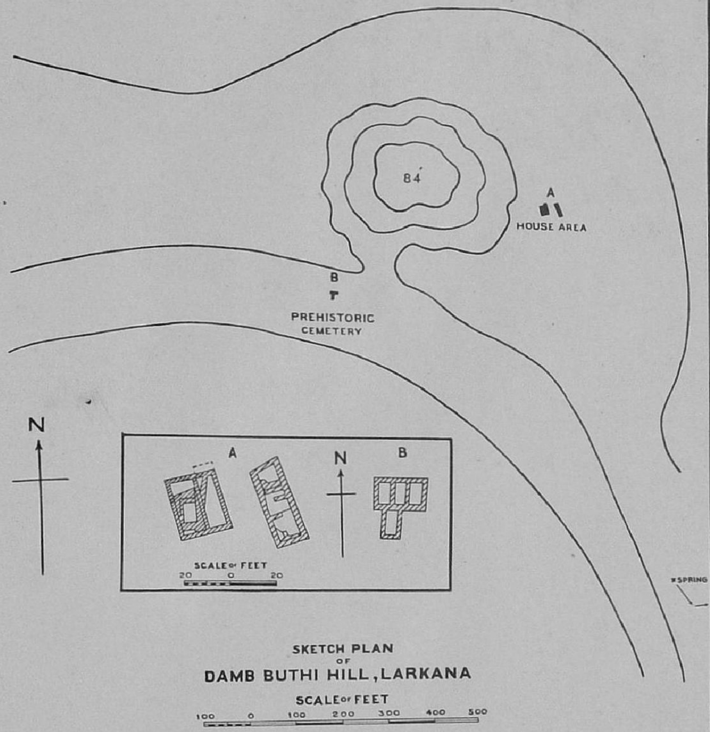


STRATA
TOP
MIDDLE
BOTTOM

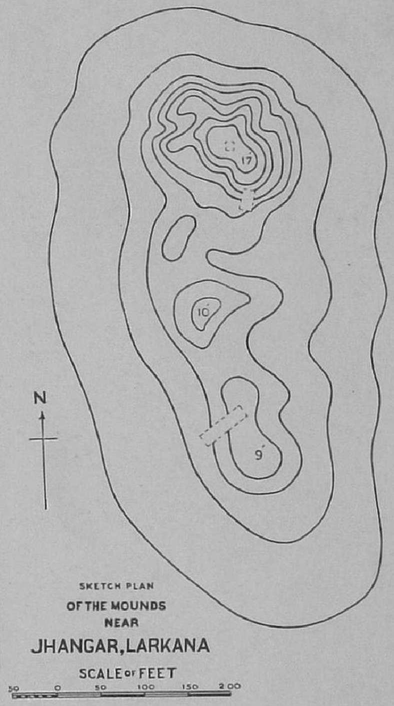
SECTION ON AB



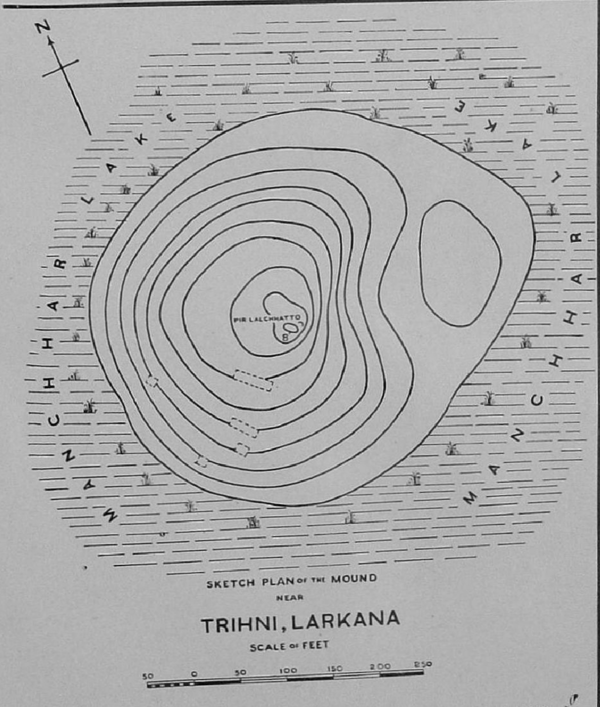
SECTION ON CD



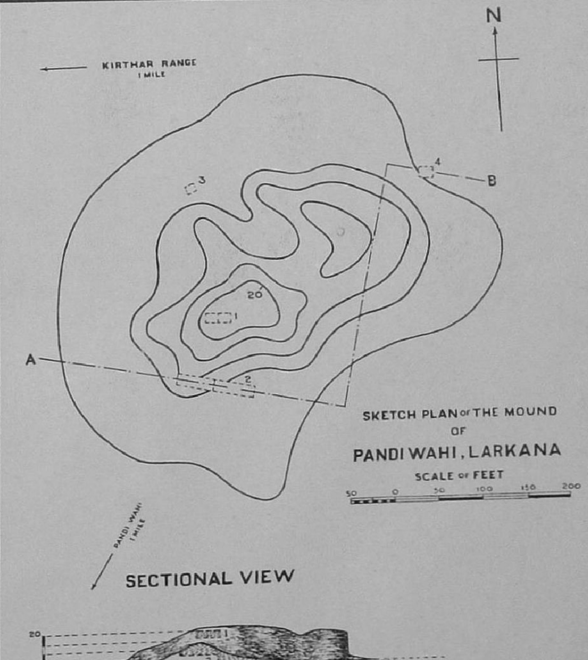
SKETCH PLAN OF DAMB BUTHI HILL, LARKANA



SKETCH PLAN OF THE MOUNDS NEAR JHANGAR, LARKANA

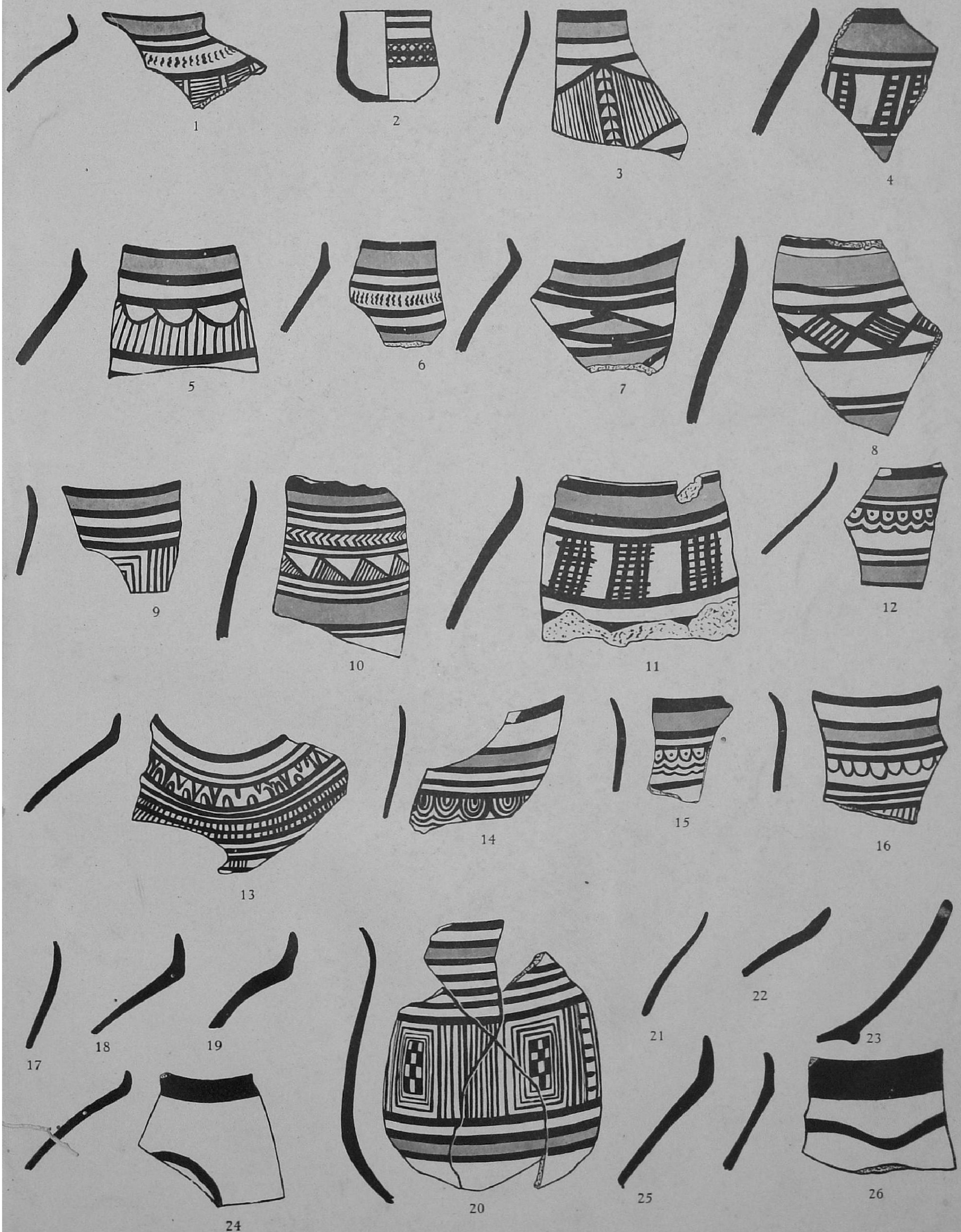


SKETCH PLAN OF THE MOUND NEAR TRIHNI, LARKANA



SKETCH PLAN OF THE MOUND OF PANDI WAHI, LARKANA

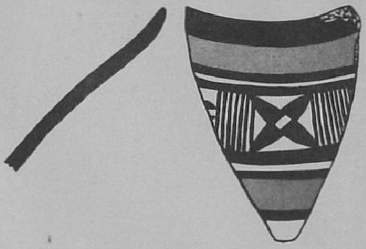
TYPES OF POTTERY FROM AMRI AND OTHER SITES



TYPES OF POTTERY FROM CHAURO AND PANDI WAHI

1

2



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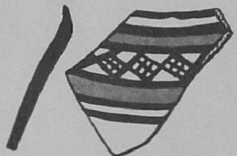

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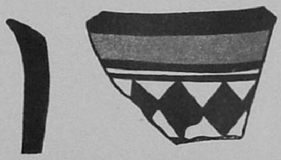

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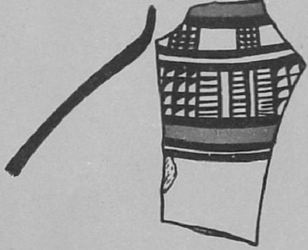

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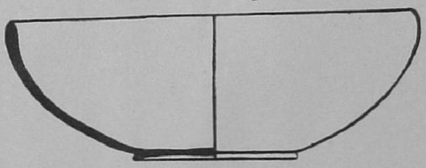
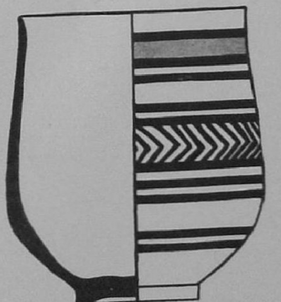
11



12

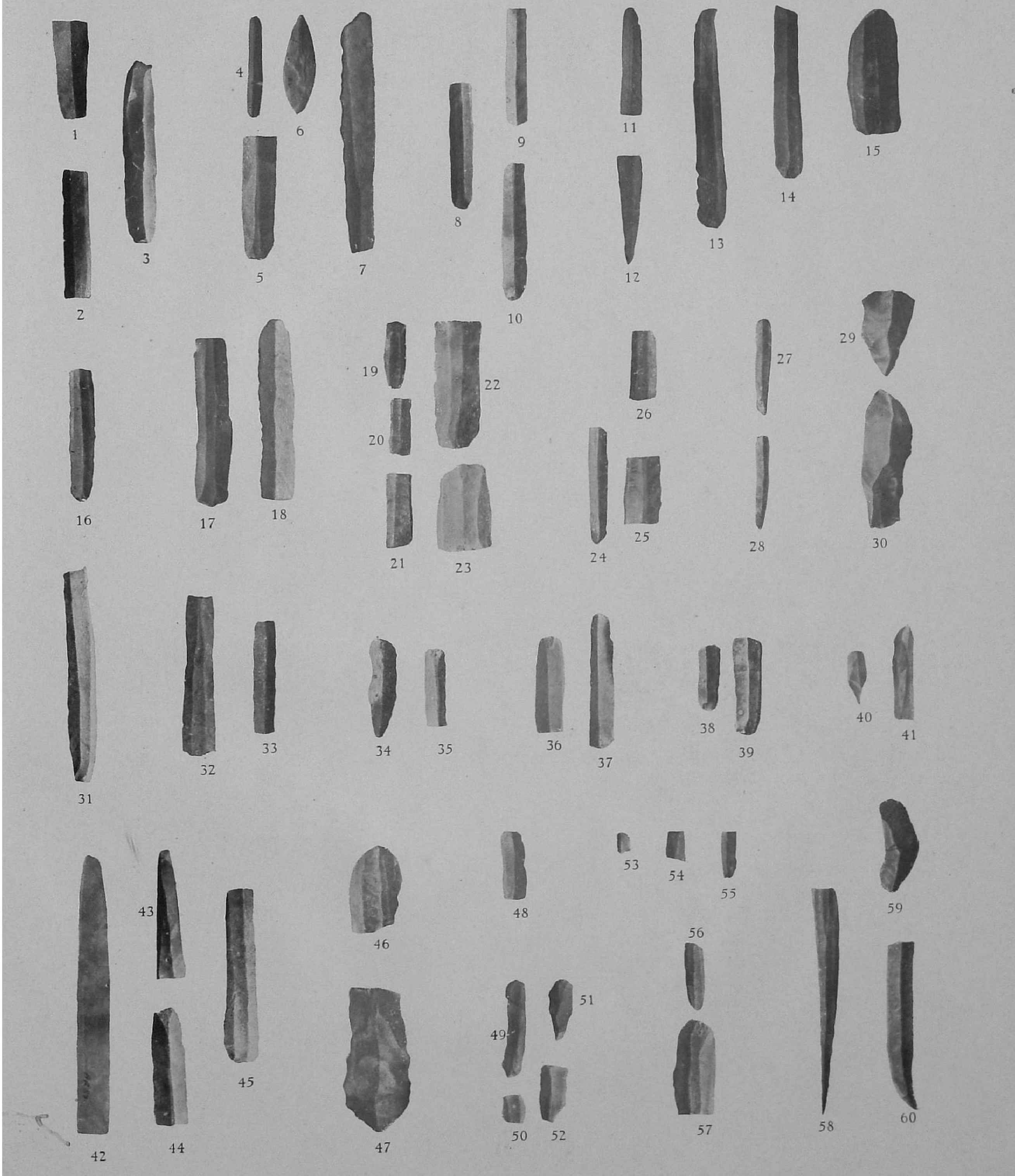
13

14



15

CHERT IMPLEMENTS



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FOREWORD.

At the suggestion of Sir John Marshall I am publishing Mr. Ross's paper on "The Numeral-Signs of the Mohenjo-Daro Script". The gist of the article is that it is unlikely that the base-language of the Indus Script is the parent language of any of the non-Indo-European language-groups of India (Dravidian, Munda, Burushaski), but that it might be Primitive Indonesian. His researches in this connection appear to be scientific and a definite step in the right direction towards the interpretation of the signs.

J. F. BLAKISTON,
Director General of Archæology.

NEW DELHI,
The 4th January, 1937.

THE "NUMERAL-SIGNS" OF THE MOHENJO-DARO SCRIPT.[1]

PRACTICALLY all the material so far available for a study of the Mohenjo-daro script is that contained in J. Marshall, *Mohenjo-daro and the Indus civilisation* (cited here as Marshall) and G. R. Hunter, *The script of Harappa and Mohenjodaro and its connection with other scripts.*[2] On Plates CIII-CXV of Marshall's book photographs of a large number of seal-impressions are given and on pp. 402-5 of Vol. II details of the seals will be found. There are further a few other inscriptions depicted elsewhere in Vol. III. Hunter's book contains drawings of a much larger number of inscriptions. But for various reasons I shall confine myself in this monograph to the inscriptions on Plates CIII-CXV of Marshall's book and to these the inscription-numbers (1 to 557*b*) refer.[3]

The Mohenjo-daro script is still too recent a discovery for the multitude of peculiars necessary for its printing to be available. The following typographical device has therefore been adopted in this monograph. On Plate I a list of all the signs here referred to is given, each sign being accompanied by a number; throughout this monograph the signs are always indicated by these numbers printed in *italic.* A notation such as *7a/04* means "the sign *7a* enclosed in the 'bracketing-sign' *04*". Combinations are indicated by placing a dash between the sign-numbers, the order being of course that given here; thus *3c—35* means *3c* with *35* on its immediate right. Below each sign-number on Plate I stands another number enclosed in brackets; this is the number of the inscription from which, as affording the clearest and most typical example available, a tracing of the sign in question has been made. Dotted lines are added as some indication of the position of the sign in the line, though it should be borne in mind that, in many of the inscriptions, the alignment is rather ragged; broken lines indicate defacement of the inscription.

In the Table subjoined the correspondences between the numbers of my signs and the numbers of the signs in (*a*) Langdon's Sign List (Marshall ii, 434-52) and (*b*) the Sign Manual in Marshall iii, Plates CXIX-CXXIX are given. The entry of *cf.* before a sign-number under *a* or *b* indicates that the sign in question is either given in a different way or in a slightly different form in the other sign-list. The capital letters in Langdon's Sign List refer to his list of 'accents' (Marshall ii, 428-30).

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[1] The central point of hieroglyphic theory on which the whole thesis of the present monograph rests—that which underlies the methodology of Tables I and II, in which the emphasis is laid rather on non-occurrent sign-combinations than on those occurring (which would accord with the practice hitherto adopted in discussions of undeciphered scripts)—is due to Stefanyja Olszewska. I should also like to express my thanks to Professor J. Bloch (Paris), Colonel D. L. R. Lorimer, Professor J. Przyluski (Paris) and Professor Ph. S. van Ronkel (Leiden) for advice on various points.

[2] A few inscriptions have been published elsewhere; these are listed by Hunter, *op. cit.* pp. 8-11.

[3] There is however one inscription given in Hunter *op. cit.* (No. H. 100*f.* on Plate XXXI), not in Marshall, which contains a fairly certain example of an important numeral-sign (*8*) not recorded with certainty in Marshall's inscriptions.

No. on Plate I.	a	b	No. on Plate I.	a	b
01	E	..	*23*	89	CCXLII
02	C	..	*24*	90	CCXLIII
04	..	XX	*25*	..	CCXLIV
05	..	*cf.* CCCXXXV	*28*	93	CCLXI
06	F	..	*29*	70	CCXIX
1a	A	..	*31*	145^2	CCXXIII
1c	264	I	*32*	145^3	CCXXIV
2a	B	..	*33*	91*b*	CCXXXVII
2c	265	II	*34*	94	CCXXXVI
3a, 3b	270	..	*35*	75^2	CCXXVII
3c	266	VI	*36, 37*	76, 77	CCXXVIII
3d	269, 269*b*	VIII	*38*	..	LXVII
4a	271	IX	*39*	$230b^2$	LXVIII
4b	267	..	*40, 41*	227, $230b^1$	LXIX
4c	274*b*	X	*42*	96	..
5a	272	XI	*45*	97^3	..
5b	268	(XI)	*46*	*cf.* 97^7	..
5c	..	XII	*49*	96*b*	..
6a	273	..	*50*	68	CCLXXIV
6b	275	XIII	*51*	..	CCCXXXI
7a	..	XIV	*52*	176	CCCXLIV
7b	278	XV	*53*	175^1	CCCXXXVIII
8	..	XVII	*54*	177	CCCXLVI
9	..	CLXXXVI	*55*	178	CCCXLI
12a	277	XVIII	*57*	175^3	CCCXXXIX
12b	..	CLXXXV	*59*	*cf.* 181	CCCXLIX
13	H	XXXIX	*60*	*cf.* 176*b*	..
14, 15	$113^{2\text{-}1}$	XLIII	*62*	223	LXXXVIII
16	153	XIX	*63*	15^2	CCLV
17	154	XXVI	*64*	15^1	CCLVI
18	156	XXVIII	*65*	*cf.* 16	CCLX
19	..	XXIV	*66*	80, 237	CCLXIII
20	40	CCLIII	*67*	40*b*	CCLXII
21	87	CCXXXVIII	*68*	168*c*	CCCLI
22	88	CCXL	*69*	6	CXXVI

No. on Plate I.	*a*	*b*	No. on Plate I.	*a*	*b*
70	8	CXXXI	*106*	..	CCCXVII
71	5	CCCIV	*106a*	38	..
72	63	CCCVIII	*107*	118	XL
73	126	CXIV	*109*	*cf.* 116	CLXVI
74	130*b*	CXX	*110*	98	..
75	*cf.* 131*b*	CXXI	*111*	100	CLXX
76	72	CCXLVII	*112*	119^{1}	CLVII
77	232	LXV	*113*	119^{3}	..
78	*cf.* 234	LXXVIII	*114*	120	CLIV
79	224	L	*115*	$120b^{1}$	CLV
80	231	LXIV	*116*	$120b^{3}$	CLVI
81	229	*cf.* LXXXV (81, 82)	*117*	124	CLIX
82	..		*118*	*cf.* 101	*cf.* CXCVIII
83	233	LXXIII	*119*	170	CCCLIV
84	206	CCCXXX	*120*	173	CCCLV
85	1	CCLXXVII	*121*	*cf.* 167	CCCLXI
86	..	CCLXXXI	*122*	166	..
87	214	..	*124*	135	XCVI
88	211	CCCXXV	*125*	..	XCV
89	182^{2}	CCCLXX	*126*	134	XCIV
90	191	CCCLXXV	*127, 128*	*cf.* 107	CCLXXIII (127–130)
91	*cf.* 103*	CCCLXXXII	*129*	*cf.* 109^{2}	
92	196	CCCLXXVII	*130*	..	
93	198	CCCLXXVIII	*131*	149	XCVII
94	*cf.* $199b^{2}$	*cf.* CCCXCIII	*132*	53^{2}	CXXXVII*a*
95	*cf.* $199b^{1}$	CCCXCII	*133*	220	LXXXIX
96	187	CCCLXXIX	*135*	21^{2}	CCXCIX
97	188	CCCLXXX	*136*	43	*cf.* CXCI
98	202	CCCLXXXI	*137*	*cf.* 238	*cf.* LVIII
99	204	CCCXCVI	*138*	235	LIV
100	..	CCCLXXXVI	*139*	241	LX
101, 103	$195b^{1-2}$	CCCLXXXVIII	*140*	56	CXLIV
102	..	CCCLXXXVII	*141*	244	LXXXIII
104, 104a	47	XCIX, CII	*142*	*cf.* 163	*cf.* XLVI
105	52	CIX			

* *See* note on p. 13.

By the 'numeral-signs' of the Mohenjo-daro script I understand here the following signs (for examples of occurrence *see* the Tables):—

1a, 1b. One small vertical stroke (less than a third of the line in height) either (*1a*) at the top of the line or (*1b*) in the middle.

1c. One long vertical stroke (the height of the line).

2a, 2b. Two small vertical strokes (less than a third of the line in height) either (*2a*) at the top of the line or (*2b*) in the middle.

2c. Two long vertical strokes (the height of the line).

3a, 3b. Three medium-sized vertical strokes (about half the height of the line) either (*3a*) at the top of the line or (*3b*) in the middle.

3c. Three long vertical[1] strokes (the height of the line).

3d. Under this head I include a group of very similar signs, all of rare occurrence. All consist of two vertical strokes with one vertical stroke below them. We may distinguish the following varieties:—(α) The strokes are arranged with the lower one between the two upper ones, and the sign fills the whole height of the line. (β) The same on a smaller scale, only about two-thirds of the height of the line being filled. (γ) The lower stroke is under the left-hand upper stroke. (δ) The lower stroke is under the right-hand upper stroke. Both (γ) and (δ) are on the same smaller scale as (β).

4a. Four medium-sized vertical strokes (about half the height of the line) in the middle, or slightly towards the lower part of the line.

4b. Four long vertical strokes (the height of the line).

4c. Two vertical strokes with two more under them, the sign filling the whole height of the line.

5a. Five vertical strokes, in the middle or slightly towards the lower part of the line. We may distinguish three varieties according as the strokes are (α) medium-sized (about half the height of the line), (β) small (less than a third of the line in height) or (γ) fairly large (slightly more than half the height of the line).

5b. Five long vertical strokes (the height of the line).

5c. Three vertical strokes with two more under them, the sign nearly filling the height of the line.

6a. Six small vertical strokes (about a third of the line in height) towards the lower part of the line.

6b. Two rows of three vertical strokes, the sign filling the whole height of the line.

7a. Seven medium-sized vertical strokes (about half the height of the line) in the middle of the line.

7b. A row of four vertical strokes with a second row of three similar strokes below them, the sign filling the whole height of the line. The horizontal discrepancy between the two rows is made up either by spacing the lower row wider, as in No. 25, or by overlapping (always to the left), as in No. 344.

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[1] In Nos. 170, 209, 326 these three strokes have a slight /-slant.

8. Two rows of four vertical strokes, the sign filling the whole height of the line; *see* below, p. 12.

9. Three rows of three strokes arranged in a zig-zag fashion, the sign filling the whole height of the line.

12a. Three rows of four vertical strokes, the sign filling the whole height of the line.

12b. Three rows of four strokes arranged in a zig-zag fashion, the sign filling the whole height of the line.

Two points require further comment :—

(I) As discussed below there are a few cases in which a numeral-sign is written under, or nearly under the numeral-sign *2a* (and sometimes *1a*) on its immediate right. Under these circumstances it tends to occur in a position slightly lower than normal. Cf. Nos. 91 (*3b*); 31, 76, 143 (*4a*); 54, 131, 402 (*5a*).

(II) In the case of the numeral-signs composed of long vertical strokes (the height of the line) there occasionally appear microscopic (but quite definite) excrescences on one or more of the strokes; these excrescences sometimes appear to form a bridge between two strokes. The examples are diagrammatically depicted (enlarged) on Plate II. The markings are so small that a necessary preliminary to any real discussion of their possible significance would be an examination of the originals under the low-power microscope. But it seems possible that the combination *3c*—*35* in No. 429 may afford a clue. For this very frequent combination (it occurs 14 times elsewhere) appears here, as far as we can judge from the photograph, as illustrated diagrammatically on Plate II. An impression of ligaturing is given and it may well be that something similar is intended in the other examples of bridging; the excrescences may be rudimentary bridges.

Certain signs, namely *13* (and the other similar signs given in Marshall's Sign Manual No. XXXIX), *20* and the 'bracketing' signs *01*, *06* used surrounding another sign (*see* also below, p. 11), although perhaps in some ways reminiscent of numeral-signs, seem better excluded from the discussion.

The way in which the numeral-signs are used in the Mohenjo-daro script is shown in Tables I and II. In these Tables the signs in the left-hand vertical column are the numeral-signs; the top horizontal row contains, in Table I, all the signs found immediately to the left-hand of a numeral-sign in an inscription, in Table II, all those found immediately to the right-hand[1]; the Tables are filled in by placing a number indicating the number of occurrences of the combination in the inscriptions in each of the squares opposite to a numeral-sign in the left-hand vertical column and below the signs in the top horizontal row immediately to the right (Table I) or left (Table II) of which it occurs.

I give below the details of the numbers entered in the squares of the Tables, *i.e.*, the numbers of the inscriptions in which each combination containing a numeral-sign is found.

[1] For completeness there should be a third table showing the occurrences of the numeral-signs between bracketing-signs. But actually there would be only one entry in it——*7a*/*04* in No. 231.

TABLE I.

1a.

1c :—30.
4a :—418, 449.
5a :—402.
8 :—71 ?
17 :—221.
24 :—21.
41 :—401.
52 :—455.
54 :—109.
55 :—108.
65 :—494.
68 :—309.
110 :—203.
124 :—438.
132 :—405.

1b.

6b :—439.
37 :—61.
105 :—319.
117 :—329.
142/01 :—122.

1c.

4a :—266.
22 :—106.
35 :—168, 202.
66 :—286, 336.
69 :—429.
81 :—28.
90 :—189.
102 :—287.
103 :—30.
125 :—187.
141 :—55.
89/03 :—218.

2a.

2c :—14, 47, 79, 82, 114, 324, 468, 491, 549, 551.
3b :—91.
3d :—74.
4a :—19, 31, 76, 143, 229, 246, 395.
5a :—54, 131, 346.
5c :—157.
6b :—35, 314.
7b :—146, 344.
12a :—3, 105.
14 :—78, 86, 127.
28 :—294.
32 :—340.
35 :—26, 115, 181.
38 :—104, 142.
39 :—88, 540.
40 :—6, 80.
41 :—430, 445.
49 :—51.
52 :—327.
53 :—42, 165, 326, 328, 456.
54 :—52, 57, 87, 98, 158, 317, 349, 369, 396, 400, 433, 492.
55 :—11, 49, 65, 77, 96, 97, 351, 534, 553, 554.
56 :—180, 367.
57 :—33.
59 :—330.
61 :—407.
63 :—50, 310.
64 :—94, 151.
66 :—121, 139, 322.
67 :—465.
69 :—315.
84 :—537.
86 :—451, 493.
87 :—150.
88 :—200.
91 :—334.
92 :—424.
102 :—178.
104 :—429, 557.
109 :—436.
113 :—416.
114 :—22, 466.
116 :—274.
118 :—32.
119 :—228.
123 :—10.
124 :—28, 58, 232, 426, 557*b*.
126 :—494.
85/02 :—39.
51/05 :—148.

TABLE I—*contd.*

2b.

2c :—48.
54 :—60.
55 :—373.
79 :—478.
99 :—331.
54/01 :—403.

2c.

2a :—26.
17 :—540.
21 :—42, 77, 146, 215, 369, 541.
22 :—536.
51 :—8, 14, 23, 47, 79, 81, 82, 87, 114, 120, 324, 468, 491, 549, 551.
66 :—47.
69 :—174, 222.
71 :—26.
74 :—432.
93 :—65, 406.
102 :—205.
133 :—205, 552.
51/01 :—48.

3a.

99 :—116.
104a :—282.

3b.

16 :—275.
42 :—220, 270, 361.
47 :—411.
51 :—41.
52 :—365.
99 :—339.
101 :—129.
107 :—29.
110 :—179.

3c.

3c :—54, 539.
7b :—557.
12a :—414.
14 :—425.
25 :—431.
28 :—104.
33 :—429.
64 :—209.
73 :—54.
104a :—456, 542.
117 :—3, 8, 30, 65, 68, 94, 105, 147, 168, 170, 251, 326, 345.
133 :—541.

3d.

2c :—432 (β).
16 :—74 (α).
53 :—306 (β).
54 :—544 (γ).
55 :—529 (α), 530 (α).
80 :—552 (δ).
133 :—257 (α).
134 :—366 (α).

4a.

16 :—453.
42 :—76, 143, 159, 229, 395.
44 :—207.
46 :—246, 449.
47 :—418.
52 :—19.
99 :—266.

4b.

23 :—342.

4c.

21 :—74.

5a.

16 :—92 (β), 311 (γ), 460 (α).
42 :—131 (α), 301 (α), 346 (α).
45 :—441 (γ).
46 :—422 (γ).
48 :—402 (α/γ).
108 :—51 (α).

5b.

85 :—6.
96 :—50.
97 :—37.

TABLE I—*concld.*

5c.

42 :—157.

6a.

33 :—66.

6b.

42 :—35, 243, 249.
43 :—309.
48 :—439.
58 :—314.

7a.

21 :—123, 466.

7b.

46 :—25.
71 :—113, 211, 435.
72 :—146, 344, 553, 557

8

46 :—71 ?
106a :—H. 100.

9

2c :—273.

12a.

21 :—156, 414, 548.
39 :—105.
53 :—3.
54 :—470.
100 :—79.
111 :—404.

12b.

34 :—415.

TABLE II.

1a.

17 :—21.
21 :—418.
26 :—494.
27 :—402.
30 :—452.
43 :—309.
51 :—71 ?
83 :—109, 221, 401, 405, 438, 455.
98 :—449.
107 :—108, 203.
117 :—30.

1b.

21 :—122, 439.
22 :—329.
83 :—61, 337.
107 :—67, 394.
129 :—319.

1c.

1a :—30.
13 :—189.
22 :—286.
33 :—429.
104 :—336.

2a.

2c :—26.
15 :—349.
31 :—549.
35 :—310.
42 :—87, 150.
46 :—58.
50 :—51.
65 :—314.
70 :—49.
73 :—11, 54, 57, 78, 80, 85, 91, 94, 97, 98, 104, 115, 127, 157, 158, 181, 246, 291, 324, 328, 340, 367, 369, 426, 429, 433, 456, 476-7, 494, 537, 551, 557*b*.
75 :—416.
77 :—3, 14, 19, 22, 31, 32, 39, 82, 86, 96, 131, 143, 146, 162, 229, 232, 239, 274, 317, 322, 326, 334, 351, 372, 424, 451, 465, 466, 493, 553, 554.
78 :—59, 294, 396, 445.
81 :—28.
82 :—35.
83 :—10, 74, 76, 79, 88, 105, 114, 148, 178, 200, 327, 344, 400, 407, 430, 436, 468, 498.

TABLE II—*contd.*

94 :—165.
95 :—42.
96 :—50.
104 :—121.
106 :—142.
115 :—540.
127 :—33.
128 :—47.
131 :—52, 139, 315, 395.
135 :—180.
136 :—65.
137 :—151, 330.
121/04 :—6, 77.

2b.

13 :—478.
19 :—403.
22 :—331.
42 :—48, 60.
(51-71)/01 :—373.

2c.

2a :—14, 47, 79, 82, 114, 324, 468, 491, 549, 551.
2b :—48.
3d :—432.
9 :—273.
13 :—174.
18 :—42.
22 :—81, 222.
51 :—540.
55 :—87.
71 :—26.
83 :—266, 406.
104 :—23.
107 :—8.
133 :—77, 146, 205, 215, 369, 536, 541.
138 :—47.

3b.

2a :—91.
13 :—361.
16 :—129.
22 :—41, 179.
23 :—29.
41 :—454.

3c.

3c :—54, 539.
35 :—30, 65, 94, 104, 105, 168, 170, 251, 326, 345, 425, 429, 456, 541, 557.
36 :—3, 8, 68, 147, 414.
76 :—209.
107 :—539.
112 :—54.
122 :—431.

3d.

2a :—74 (α).
130 :—552 (δ).
139 :—544 (γ).
60/04 :—529 (α), 530 (α).
121/04 :—306 (β).

4a.

1a :—418, 449.
1c :—266.
2a :—19, 31, 76, 143, 229, 246, 395.
22 :—159.
120 :—207.

4b.

29 :—532.

4c.

16 :—74.

5a.

1a :—402 (α/γ).
2a :—54 (α), 131 (α), 346 (α).
22 :—92 (β).
74 :—311 (γ).
99 :—301 (α).

5b.

16 :—191.
36 :—6.
62 :—37, 50.

5c.

2a :—157.

6a.

114 :—66.

6b.

1b :—439.
2a :—35, 314.

TABLE II—*concld.*

7a.

114 :—123, 466.

7b.

2a :—146, 344.
3c :—557.
13 :—211.
21 :—553.
22 :—442.
104 :—435.

8.

1a :—71 ?

12a.

2a :—3, 105.
3c :—414.
55 :—79, 404.
52/01 :—156.
69/01 :—478.

12b.

57 :—415.

With regard to the Tables the following further points should be noted :—

(I). Only those inscriptions of which the reading is certain are included; *e.g.*, Nos. 7, 27 are excluded. In some cases only the sign to one side of the numeral-sign is clear, that on the other being uncertain (cf. Nos. 228, 275 and Nos. 59, 239) and in such cases only the one certain entry is made in the Tables.

(II). In a few cases two or more of Marshall's numbered photographs refer to different faces of the same object. The objects of this type with inscriptions containing numeral-signs are L 323 (illustrated as Nos. 227 and 230), HR 2240 (as Nos. 471-2-3), E 904 (as Nos. 476-7)—*See* Marshall ii, 373—and DK 2797 (*see* No. 325). Of these E 904 (Nos. 476-7) has the same inscription on both faces and it is therefore treated in the Tables as *one* inscription. In the present state of our knowledge it is clearly impossible to determine the relation between the inscriptions on the different faces of such objects—whether they are, in fact, one inscription running over two faces or two separate inscriptions—and the other inscriptions of this type (Nos. 227-30, 325 and 471-2-3) are therefore not treated in the Tables.

(III). With regard to the (comparatively few) inscriptions containing two or more lines the position is rather similar. It is a reasonable hypothesis that all single-line inscriptions are to be read in the same direction as that line of a multilinear inscription which is to be read first. I hope to show elsewhere that, this hypothesis being admitted, (1) this line must be the top one; and (2) the direction of the script must be from right to left.[1] But, in general, this second conclusion is not relevant to the present discussion. For the Tables merely record combinations actually occurring without reference to the order in which they are to be read. The first conclusion, however,—that it is the top line of a multilinear inscription which is to be read first—is relevant to the discussion. For, if a numeral-sign occurs in a multilinear inscription, its true position relative to its immediate neighbours must, on this assumption, be that actually appearing in the inscription, provided it is in the interior of the top line, *i.e.*, from the point of view of the Tables we may treat a numeral-sign occurring in the interior of the top line of a multilinear inscription precisely

[1] This conclusion—that the direction of the Mohenjo-daro script is from right to left—is also reached (with the use of a different method) by C. J. Gadd and S. Smith (Marshall ii, 411), by S. Langdon (Marshall ii, 427), by Marshall (i, 40) and by Hunter (*op. cit.* p. 37 *ff.*).

as if this top line was a separate single-line inscription. But numeral-signs occurring in other positions in multilinear inscriptions, whether in one of the extreme positions in the top line or in any position in a line other than the top one, cannot be so treated. For in such cases there are other things to be considered: apart from the question of the direction of the script in general, there arises the much more difficult question of the mutual relations of the lines in a multilinear inscription—whether the reading is right to left in all lines or whether it is sometimes (or always) boustrophedon—a question to which there does not appear to be at present a satisfactory answer. Hence we cannot decide, for example, whether the true position of a numeral-sign occurring in the interior of the second line of a multilinear inscription is that actually appearing (as it would be if the direction were the same in both lines) or whether the position actually appearing should be reversed (as it would have to be if the reading were boustrophedon). Similarly we cannot decide which sign of the second line of a multilinear inscription is to be read next to a numeral-sign occurring at the extreme left of the top line. If we were to make use of the second conclusion —that the general direction of the script is from right to left—we might safely include numeral-signs occurring at the extreme right of the top line of a multilinear inscription. But for the purposes of the present discussion it will suffice if we make use only of the first conclusion—that the top line of a multilinear inscription is to be read first. Hence, in the Tables, I include all examples of numeral-signs occurring in the interior of the top line of a multilinear inscription (as in Nos. 52, 139, 209, 329, 396, 400—first line) and treat them as if the other lines were not present but I exclude all examples of numeral-signs occurring in other positions in a multilinear inscription, whether in lines other than the top one (as in Nos. 126—second line, 253, 321, 385, 400—last line) or in the top line but either on its extreme left (as in Nos. 126—first line, 303) or its extreme right (as in No. 247). In concluding this section I may emphasise the fact that the total number of occurrences of numeral-signs in multilinear inscriptions (14 in all) is small.

(IV). In the case of bracketing-signs, which are used enclosing other signs, the sign and its bracket are entered, for convenience, as one sign in the Tables. Here I may note that there are a few cases in which it is doubtful whether we are dealing with bracketing- or numeral-signs, *viz.*:—

(*a*) *85/02* in No. 39; *2b—85—2b* or *85* bracketed by *02*? The sign *2b* (rare in any case) occurs nowhere else in combination with *85*. I regard this example as bracketed and read *85/02*.

(*b*) *89/03* in Nos. 117, 218, 532; *1c—89—1c* or *89* bracketed by *03*? The sign *1c* occurs nowhere else in combination with *89*. I regard these examples as bracketed and read *89/03*.

(*c*) *2c—133—2c* in No. 205; as printed or *133* bracketed? The sign *2c* occurs elsewhere both to the left and right of *133*. I do not regard this example as bracketed and read *2c—133—2c*.

(*d*) *2c—71—2c* in No. 26; as printed or *71* bracketed? I do not regard this example as bracketed and read *2c—71—2c*.

(V). At first sight it might seem that the correct resolution of groups of signs composed of (i) two or more numeral-signs, (ii) numeral-signs and some of the rather similar signs (*e.g.*, *13*) not included here under the head of numeral-signs (*see* p. 5) or (iii) numeral-signs and bracketing-signs, would be a matter of some difficulty. Thus as a theoretical point we might ask whether we can be certain that a group of six vertical strokes is to be read as two *3c*'s and not as one 'six'-sign. In the great majority of cases there is, however, no practical difficulty whatsoever (*cf.*, for the above-mentioned example, Nos. 54, 539). This can best be seen by a careful comparison of the examples given in squares [*1a* to *12b*] × [*1c* to *17*] and [*51/01* to *51/05*] of Table I and [*1a* to *12b*] × [*1a* to *17*] and [(*51—71*)/*01* to *121/04*] of Table II with the other occurrences of the numeral-signs in question. The technique of the script nearly always makes it quite clear what is intended. A few special cases,[1] however, call for further consideration. For, in some inscriptions (*e.g.* Nos. 31, 402), the sign *2a* (and in one, *1a*), instead of being correctly spaced, is apparently written over the preceding sign. The question arises, therefore, whether we are to read, in No. 31, *4a—2a* or a new 'six'-sign. The first alternative is almost certainly correct; the group *42—4a—2a—77* (and similar groups) occurs several times elsewhere (*see* the Tables). In No. 246 the group *4a—2a—73* occurs, only here the *2a* is not exactly over the *4a* but very slightly to the right of it. It is a reasonably safe assumption that these three positions of the group *4a—2a* (correctly spaced, the *2a* over the *4a*, the *2a* nearly over the *4a*) do not indicate a difference in meaning. Similarly with Nos. 54, 76 and 131. In No. 402 also similar considerations apply. In all these cases, therefore, the two signs are entered.

(VI). *Miscellaneous notes to individual inscriptions.* No. 50. The sign *2a* is placed over the left hand of the *96* (*cf.* V above).

No. 66. There is no evidence as to whether *2a—1c* or *1a—13a* is to be read and nothing is therefore entered in the Tables.

No. 71. It is doubtful whether a 'nine'-sign is to be read or *8—1a*. Against the first alternative it might perhaps be urged that the similar 'seven'-sign (*7b*) is written with the over-lapping stroke to the left, not to the right as here. It is entered in the Tables but marked with a query.

No. 106. Either *1c—13a* or *1c—1a—1c* might be read. The fact that *1c—1a* occurs in No. 30 is so slight a piece of evidence in favour of the second alternative that it seems better to omit the second and third strokes from the Tables.

No. 113. It is quite impossible to resolve the last seven strokes of this inscription in any certain fashion, though the second and third signs are certain.

No. 162. The correct resolution of the middle part of this inscription is doubtful and nothing is therefore entered in the Tables.

No. 214. It is doubtful how the strokes towards the right of the inscription are to be read and nothing is therefore entered in the Tables.

No. 224. It is doubtful whether the stroke appearing between the second and third signs is intended. It is not entered in the Tables.

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[1] *See* also the miscellaneous notes to individual inscriptions.

No. 266. The shortness of *1c* here is probably due to lack of space.

No. 270. This seal is very small and *3b* approaches *3c* in size.

No. 309. An inscription round part of a circle.

No. 341. It is not clear whether this is a two-line inscription, nor, in fact, how the last group of three signs is to be read.

No. 427. In Hunter's sketch (*op. cit.* No. M. 7) this appears reversed. Without reference to the original object the situation is not clear and no entry is made in the Tables.

No. 436. The spacing would appear to indicate that one sign (*109*) is intended and the entry is made in this way. There is nothing in the combinations recorded elsewhere to support the alternative reading with *1b—2a*.

No. 478. The low position of *2b* here may well be due to the fact that the inscription runs round part of a circle.

It is quite possible that some of the numeral-signs are mere variants of others with no difference in meaning intended. But the question of significant or non-significant variants is quite insoluble at the present state of our knowledge; more, it is irrelevant to the present discussion. It is furthermore quite possible that some of the signs here called 'numeral-signs' may have no connection with numerals; the suggestion, for instance, that the signs *1a* and *2a* may imply something similar to the gunification of Sumerian is an obvious one. But, taking the numeral-signs as a whole, it is quite inconceivable that there should not be represented among them signs having some connection with the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 12. Had there been only a few numeral-signs the obvious similarity to numerals might have been dismissed as due to pure chance, but the presence of such a series cannot possibly be fortuitous.

That there is some connection between the numeral-signs and the numbers is thus obvious but the determination of the type of this connection is not so easy.

Let us first consider the obvious possibility—that some or all of the numeral-signs actually signify the numbers indicated, *i.e.*, that the numeral-signs are simple ideograms. There has already been some discussion of this possibility[1]; but there is one argument which conclusively shows this hypothesis to be untenable. This is the evidence of Tables I and II. It is clear that, if some of the numeral-signs are ideograms signifying the numbers indicated, the positions of the numeral-signs relative to the other signs of the script might be expected to be, in many cases, similar. On the ideogram-hypothesis we should expect that the same sign would often be found to the immediate left or right (according to the direction of the script and the position of the numeral with regard to the thing qualified in the language concerned) of different numeral-signs. Actually this is not the case; in Tables I and II the distribution of the filled-in squares over the vertical columns appears to be a random one and we may say that on the whole (there are a few exceptions) the same sign does not stand in juxtaposition to different numeral-signs but, on the contrary, that in general the numeral-signs occur in juxtaposition to different non-numeral-signs. The combinations

[1] Marshall ii, 412 ff.; 417.

of frequent occurrence are perhaps particularly striking:—*2a* occurs frequently (here taken as 'more than 6 times') to the right of *2c* (10 x), *4a* (7 x), *54* (12 x), *55* (10 x) and to the left of *73* (32 x), *77* (31 x), *83* (18 x); *2c* to the right of *51* (15 x) and to the left of *2a* (10 x), *133* (7 x); *3c* to the right of *117* (13 x) and to the left of *35* (15 x); *4a* to the left of *2a* (7 x). In the case of these four numeral-signs (*2a*, *2c*, *3c*, *4a*) the other component of the frequently-occurring combination is different for each one.

Under these circumstances the obvious hypothesis—that the numeral-signs are in general used as ideograms signifying actual numbers—is not tenable.

There remain, then, only two other hypotheses. The first (I) is that the numeral-signs are used to indicate, in part, numbers but chiefly words or parts of words (including endings) either (A) homonymous or (B) quasi-homonymous with the numbers in the language concerned. Under either of these hypotheses we should have to assume, from the argument against the ideogram-hypothesis given above, that the number of occurrences in which the numeral-signs actually signify numbers is small. This, of course, is quite a tenable assumption.

Hypothesis IA—that the numeral-signs chiefly represent words or parts of words homonymous with the numbers in the base-language of the script—is quite a tenable one, but it involves us in some further interesting assumptions as to the nature of this base-language. For there are not a large number of languages possessing homonyms to each of the units. Modern Chinese and, indeed, on the (very reasonable) assumption that 'tonal homonyms' would not be distinguished in the script, many languages with tones, would fulfil the conditions; but even a language like Modern English, which is comparatively rich in homonyms would fall a long way short of fulfilling them, since, although we have the sets of homonyms *one*: *won*, *two*: *too*, *four*: *for*: *fore*; *eight*: *ate* (variant pronunciation), there are no homonyms to *three*, *five*, *six*, *seven*, *nine*.

Hypothesis IB—that the numeral-signs chiefly represent words or parts of words quasi-homonymous with the numbers in the base-language of the script—is well-exemplified by Egyptian. In Egyptian a sign signifying one word can often be used to signify another quasi-homonymous with it; thus, 'rib' (Coptic *spir*[1]) came to be used for 'to attain' (Coptic *soper*) as well. And it is quite clear why it is precisely in Egyptian that we find this method in use; in Egyptian it is the triliteral base of a word that is its essential part and hence words with the same triliteral base, such as Coptic *spir*, *soper*, could be regarded as virtually homonymous. But it seems doubtful whether this method of using ideograms to signify their quasi-homonyms is likely to have formed the basis of a script unless special conditions (such as intensive use of ablaut) of a type comparable to those in Egyptian obtained.

Of our first Hypothesis (IA or IB) we may therefore say that it is, on the whole, intrinsically improbable. For, if it is true, we must further assume,

[1] The actual vowels of Egyptian forms cannot be reconstructed with any certainty. But in certain cases (such as this one) the fact that there was a difference in vocalism in Egyptian is rendered certain by the corresponding Coptic forms.

either that the base-language was similar to Modern Chinese, or that conditions comparable to those in Egyptian obtained. It is possible that we are dealing with a language of one of these types, but, intrinsically, not very probable, for both types are rare.

There remains for discussion the only other hypothesis (II)—that the numeral-signs are used to indicate in part numbers but, chiefly, groups of phonemes. This is quite a tenable hypothesis and, if it is true, almost the only further conclusion we can draw is that it is not very probable (though not impossible) that, in the base-language, several of the numbers were very similar in sound (as is the case, for example, in Luoravetlan (Chukchee)—cf. *ηirəq, ηϐroq, ηϐraq* '2, 3, 4'), for to choose very similar words as indicators would be but a poor choice. But this further conclusion is not of great interest for phenomena of this type are rare.

Phonematological scripts may theoretically be classified as (1) alphabetic (2) syllabic (3) miscellaneous. The first two need no further comment. Under the third head I include all such scripts as, for instance, the runic Turkish alphabet. While this script is in general alphabetic, certain signs are used to indicate groups of consonants (cf. **M**=*ld* (*lt*)[1]).

On Hypothesis II—that the numeral-signs are chiefly phonematological—we may draw the further conclusion that the second, the syllabic, type of representation, is by far the most probable. The number of different signs used renders it improbable that the Mohenjo-daro script is alphabetic[2], and a 'miscellaneous phonematological' script with so large a number of signs is unlikely.

It seems therefore that Hypothesis II. 2—that the numeral-signs chiefly indicate syllables—is by far the most probable. It should be noted that, on this hypothesis, we should not be entitled to conclude that all the signs of the script were syllabic, and that the script was, in fact, a syllabary; all that we could legitimately conclude would be that the script was not purely ideographic, in that certain signs were syllabic.

We have seen that the hypothesis that the numeral-signs are in general ideograms is not tenable but that Hypotheses I and II are. Under these circumstances the fact that the numeral-signs run 1, 2, 3, 4, 5, 6, 7, 8, 9, 12 is of importance. On any of the tenable hypotheses we should suspect from this fact that none of the above numbers was a 'change-point'[3] in the base-language

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[1] V. Thomsen, *Samlede Afhandlinger* iii, 18.

[2] *See* Marshall ii, 411.

[3] In considering the numerals of a language two chief points call for discussion: the 'numeration-system(s)' represented and the 'change-points'. In order best to indicate what is meant by these terms I choose two examples, the comparatively simple numerals of Finnish and the very complicated ones of Welsh. In Finnish the numerals run:—*yksi* '1', *kaksi* '2', *kolme* '3', *neljä* '4', *viisi* '5', *kuusi* '6', *seitsemän* '7', *kahdeksan* '8', *yhdeksän* '9', *kymmenen* '10', *yksitoista* '11' (where *toista* is part. sg. of *toinen* '2nd', so that, literally, *yksitoista* means '1 of the second [ten]'), *kaksitoista* '12'.......The 'numeration-system' represented is thus decimal. *Kahdeksan* '8', *yhdeksän* '9' contain, as their first elements, some form of the words '2' and '1'; their second element is IndE. **dek̑m̥* '10'. They are thus 'subtractive' numerals meaning, literally, '10 – 2', '10 – 1' (*see* E. N. Setälä in *Suomen suku* i, 142-3). We therefore say that 8 is a 'change-point' in Finnish, for with 8 the formation of the numerals undergoes a fundamental change. Similarly 11 is another change-point (and, in all languages, it is in general true that the next number to the base of the chief numeration-system is a change-point). In Welsh the numerals run:—*un* '1'; *dau, dwy* '2'; *tri, tair* '3'; *pedwar, pedair* '4'; *pump* '5'; *chwech* '6'; *saith* '7'; *wyth* '8';

of the Mohenjo-daro script for it is not probable that a change-numeral (which must, by its very nature, be a compound) would be chosen to form part of a phonematological script or be homonymous (or quasi-homonymous) with another word or part of a word.[1] We know from evidence quite unconnected with the script that the chief numeration-system of Mohenjo-daro was decimal.[2] This is shown by the system of weights (which stands in marked contrast to the systems of Mesopotamia and Elam)[3] and measures.[4] Finally from the fact that 12 is not a change-point we should expect that, in the base-language of the Mohenjo-daro script, '12' was specifically indicated. In fact we may envisage the position with regard to the numerals in the base-language of the Mohenjo-daro script as somewhat similar to that in Modern English—the chief numeration-system is decimal and '12' is specifically indicated (cf. MnE. *dozen*).

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naw '9'; *deg* '10'; *un-ar-ddeg* '11'; *deuddeg* '12'; *tri-* (*tair-*) *ar-ddeg* '13'; *pedwar-* (*pedair-*) *ar-ddeg* '14'; *pymtheg* '15'; *un-ar-bymtheg* '16'; *dau-ar-bymtheg* '17'; *tri-* (*tair-*) *ar-bymtheg* or *deu-naw* '18'; *pedwar-*(*pedair-*) *ar-bymtheg* '19'; *ugain* '20'; *un-ar-hugain* '21'........*deg-ar-hugain* '30'........*un-ar-bymtheg-ar-hugain* '36'............*deugain* '40'........*triugain* '60'........*pedwar ugain* '80'. No less than four numeration-systems are represented here: decimal (with change-point at *un-ar-ddeg* '11'), quinary (with change-point at *un-ar-bymtheg* '16'), vigesimal (cf. *deg-ar-hugain* '30') and nonary (cf. *deu-naw* '18').

[1] The sign *9* is of particular importance for the discussion and hence deserves special consideration here. For the rejection of Primitive Dravidian as a suggested base-language for the script depends on the fact that 9 is a change-point in Primitive Dravidian (*see* p. 19) whereas it is not a change-point in the base-language of the script. (The same argument may perhaps apply to Burushaski also—*see* p. 20.) If therefore it could be shown that we lack evidence to prove that 9 is not a change-point in the base-language, we should not be in a position to reject the Dravidian (and possibly the Burushaski) hypothesis. We have seen that, if *9* (like the other numeral-signs) is chiefly used in some function that is not ideographic, then 9 cannot be a change-point. Let us examine the contrary hypothesis: that *9* is used in ideographic function, in contradistinction to the principal use of the other numeral-signs. It is unfortunate that *9* is recorded once only, in No. 273 which is clearly complete and which reads *2c—9*. On the contrary hypothesis under consideration, *9* must here mean '9'. With regard to the meaning of *2c* there are then only two alternatives:—(A) No. 273 is one of the cases where *2c* means '2' or (B) *2c* indicates a word or ending (quasi)homonymous with the word for '2' or a phonematological element in this word. If we accept A we should have to suppose that the contents of No. 273 was a pure number. If it is a pure number it must be either (α) 18 *i.e.*, 9×2 or (β) $9.10^m \pm 2.10^n$, where m and n are either integers or 0 (*i.e.*, 9 multiplied by some power of 10 *plus* or *minus* 2 multiplied by some power of 10) or $2.10^m \pm 9.10^n$—for the chief numeration-system of Mohenjo-daro is decimal (*see* above). We are probably justified in dismissing α on the grounds that (like Welsh *deunaw*) it would presuppose a nonary influence, an influence of which there is no trace at Mohenjo-daro. With regard to β we can first of all dismiss all values other than 9 ± 2, *i.e.*, 7 or 11; for the assumption of any other of the possible values given under β involves the further assumption that the inhabitants of Mohenjo-daro were familiar with the arithmetical concept of 'place-value' which, though not absolutely impossible, does not seem very probable. Against the value 7 it may be urged that there are already two well-attested 7-signs in the script (*7a*, *7b*) and, against the value 11, that the expression of 11 as $9 + 2$ is not compatible with a principal decimal system. We may say then that alternative A is improbable. If we accept alternative B we should take the meaning of No. 273 to be '9 (unknown) persons or objects' and we should then expect to find other numeral-signs used (in their secondary numerical signification) in the same situation with regard to *2c* in inscriptions closely resembling No. 273 (thus if we found an inscription reading *2c—12a* we should have some support for alternative B). Actually we find:—*2c—2a* in Nos. 14, 47, 79, 82, 114, 324, 468, 491, 549, 551; *2c—2b* in No. 48; *2c—3d* in No. 432. But none of these inscriptions bears the least resemblance to No. 273. We may say then that alternative B is improbable. Hence, on the whole, the hypothesis that in No. 273 *9* means '9' is not probable. It is therefore improbable that, in its unique occurrence, *9* is used in ideographic function. Hence we may say that it is probable that 9 is not a change-point in the base-language of the Mohenjo-daro script.

[2] All that we should be entitled to conclude from the script itself on this point would be that the base of the chief numeration-system was greater than 8 and that it was not 11; for the next number to the base is usually a change-point (*see* above) and, as we have shown, none of the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, are change-points; further 12 is not a change-point.

[3] *See* Marshall, Chap. XXIX.

[4] *See* E. Mackay, *The Indus Civilisation* pp. 135-6.

Our final conclusions are therefore (A) that the chief numeration-system of the base-language is decimal and '12' is specifically indicated and (B) that the chief function of the numeral-signs is a syllabic one. A is certain, B probable.

In conclusion it may be of interest to test (more, be it noted, as an étude than as making any definite suggestion) four language-groups against Conclusion A and against the results reached from a consideration of Hypothesis II (the probable one) and Hypotheses IA and IB (the improbable ones).

The four language-groups which I select for this test are Dravidian, Munda, Burushaski and Malayo-Polynesian. The suggestion that the base-language of the Mohenjo-daro script is the parent-language of one of the three non-Indo-european language-groups of India (Dravidian, Munda, Burushaski) is too obvious to call for comment here and, considering that G. de Hevesy has made the startling suggestion that the scripts of Easter Island and Mohenjo-daro are so strikingly similar that there can be no question of fortuitous resemblance,[1] it seems that it will at least be no waste of space to test Primitive Indonesian as the fourth language.

The rigid discipline of modern comparative philology has been applied to the Indonesian branch of the Malayo-Polynesian family to a considerable extent, to Dravidian a very little, to Munda not at all; and of Burushaski we have only just received the first adequate and scientific description.[2] Moreover any discussion of Munda questions to-day inevitably involves some mention of the vexed question of the justification for the postulation of an 'Austro-Asiatic' family consisting of the Munda and the Mon-Khmer languages (or even of an 'Austric' family consisting of 'Austro-Asiatic' and Malayo-Polynesian). The discussion of this large and difficult question must of course lie far outside the scope of the present article.[3] It should however be mentioned that the similarities between certain of the Munda and the Mon-Khmer numerals are too striking to be fortuitous (*see* Table III).

We have seen that, if Hypothesis IA is true, the base-language must be similar to Modern Chinese, in that it possesses a large number of true or 'tonal' homonyms; and that, if Hypothesis IB is true, it must be similar to Egyptian, in that certain conditions leading to the use of quasi-homonyms apply. It may be said at once that there is no evidence that either of these conditions are fulfilled by Primitive Dravidian, Primitive Munda, Primitive Burushaski or Primitive Indonesian.[4] But so little is known about the historical philology of the

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[1] *Orientalistische Literaturzeitung* xxxvii, 665-73.

[2] D. L. R. Lorimer, *The Burushaski Language* (1935).

[3] Of literature it will suffice to mention here W. Schmidt, *Bulletin of the School of Oriental Studies* vii, 729-38 (for) and G. de Hevesy, *Orientalistische Literaturzeitung* xxxix, 273-88 (against); in the latter article references to further literature will be found.

[4] With regard to Hypothesis IA it should be noted that, even if the Austro-Asiatic hypothesis be accepted, the presence of phonematological tone in Annamite (at one time included in this group) could not be regarded as representing a state of affairs original in Munda. For G. Maspero, *Grammaire de la langue khmère (cambodgien)* p. 17 shows quite clearly that Annamite cannot be considered as belonging to the same family as Mon and Khmer. And with regard to Hypothesis IB it should be noted that, although there are traces of something comparable to Indo-European ablaut in Indonesian (*see* R. Brandstetter, *An Introduction to Indonesian linguistics* p. 28 ff. and (particularly) K. Wulff, "Über 'Stammabstufung' in der malajischen Wortbildung" *Zeitschrift der Deutschen Morgenländischen Gesellschaft* lxii, 677-97)—as indeed there are in most languages—these traces could not possibly justify us in postulating anything of the same order as Hamito-Semitic ablaut for Primitive Indonesian.

Munda group and, *ipso facto*, nothing can be known about that of Burushaski, that in these cases this can by no means be regarded as certain and, even in the other two cases, the known languages are separated by so wide a gulf in time from the Mohenjo-daro civilisation, that the possibility cannot be regarded as absolutely precluded. On the whole, however, we may say that it is unlikely that the conditions necessary for either Hypothesis IA or IB to be true are satisfied by any of the four language-groups under discussion.

We have seen that, if Hypothesis II is true, the only further condition probable is that, in the base-language, the numerals are sufficiently distinct to have been chosen to form part of a phonematological script. Some idea of the position of the four groups relative to this condition may be gathered from Table III. It appears that there is nothing to lead us to suppose that the numerals of any of the four languages were so similar that they are unlikely to have been chosen to indicate syllables. But in this connection it is perhaps worth emphasising that the first nine numerals of Primitive Indonesian are remarkably suited to participation in a syllabary ; they might well be used to signify their first syllables (all different) *sa, du, tĕ, ĕp, li, ĕn, pi, wa, si.*

With regard to our certain conclusion A—that the chief system of numeration in the base-language is decimal (with no change-point below 11) and that '12' is specifically indicated in the base-language—it may first be pointed out that there is no evidence in Dravidian or Malayo-Polynesian[1] either for any trace of a duodecimal system or for a specific indication of '12'. As far as I have been able to find out[2] this also appears to hold good for Munda—with one remarkable exception. In Savara there is clear evidence of a duodecimal system cf. *mig-gal* '12', *mig-gal-əboi* '13' (*i.e.*, '12+1'), *mig-gal-ba : gu* '14' (*i.e.*, '12+2')......*miggal-tamji* '20' (*i.e.*, '12+8').[3] But a tendency to count in twelves may well be spontaneous and on the evidence of the existence of a duodecimal system in one Munda language to-day we should hesitate to postulate a duodecimal influence in the Munda of five thousand years ago.

Moreover it is quite possible that the specific indication of 'dozen' is as intrusive and comparatively recent in the base-language of the Mohenjo-daro script[4] as it is in Modern English.[5] Hence the lack of a specific indication of '12' in the four languages under consideration does not necessarily preclude

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[1] Colonel Lorimer has been kind enough to inform me that there is no general system of reckoning by dozens nor any word for 'dozen' in use in Burushaski.

[2] I may emphasise here the extreme difficulty of investigating thoroughly the counting habits of peoples. An investigation of this kind could only be satisfactorily made by means of prolonged field-work—for which even an extensive circularisation would be but a poor substitute.

[3] G. V. Ramamurti, *A Manual of the So:ra: (or Savara) Language* p. 23.

[4] It can hardly be a coincidence that the ratios of the seven exceptional weights (1, 2, 3, 4, 24, 48) described Marshall ii, 591 betray the same intrusive element 12.

[5] The word *dozen* (< Old French *dozeine*) is first recorded in English (*New English Dictionary* s. v. *Dozen*. sb.) in the Cursor Mundi (c. 1300). Although the specific indication of '12' is recent in English, the presence of the duodecimal system is not ; cf. MnE. *long hundred* '120' and *see* further J. Schmidt, *Die Urheimath der Indogermanen und das europäische Zahlsystem* (*Abhandlungen der königlichen Akademie der Wissenschaften zu Berlin*, 1890, *Philosophisch-historische Classe* Abh. II) p. 24 ff.

the possibility that one of them may be the base-language of the Mohenjo-daro script. If we assume that '12' is intrusive in the Mohenjo-daro system we might suppose that it is of autochthonous origin here also. But it is tempting to seek its origin to the west, where, in Mesopotamia (between which and the Indus Valley there was close contact[1]), the early presence of a compound system, part decimal and part sexenary,[2] might easily have given rise to such a concept.

For Primitive Dravidian we must postulate a decimal system. Moreover there is a change-point at 9 for in all the Dravidian languages '9' is a compound, containing '10' as its second element; cf. Tamil *onbadu* Malayalam *onbadu* Kanarese *ombhattu* Coorg *oyimbadu* Telugu *tommidi* Tulu *ormba* Tuda *onpath'* Kota *ormpatu* '9' with Tamil *pattu* Old Kanarese *pattu* Tuda *pattu*, etc. '10' (*see* R. Caldwell, *A comparative grammar of the Dravidian or South-Indian family of languages*, 3rd ed., p. 346 ff.). But, as we have seen (p. 16, note 1), it is probable that 9 was not a change-point in the base-language of the Mohenjo-daro script; hence it is not probable that this base-language was Dravidian. Before leaving the point it should, however, be emphasised that this rejection of Dravidian is not certain for it rests on a view of a single inscription which, though probable, is by no means certain.

The two chief numeration-systems of the Munda languages of to-day are the decimal[3] and vigesimal[4] (with no change-point below 11).[5] But from the striking similarities in the first four numerals of the Munda and Mon-Khmer languages (contrasted with the much greater divergency after 4) we should be inclined to suspect here the presence of a very old quaternary system as well. This view receives support from the common Santali units (Bodding, *op. cit.* p. 21) *gaṇḍa* 'a quadruplet', *p̱on* '80' (*i.e.*, '4[×20]'), "used in counting paddy seedlings and straw bundles and certain other things (cocoons, Indian corn cobs, etc.)". Moreover there is one Munda language, the little-known Gadaba (Grierson iv, 229 ff.), in which '8' is expressed as '2×4' and '9' as '$\overline{2\times4}+1$'.[6] Cf. further the traces of the quaternary system in Mon-Khmer, as in Khmer *muy ḏam̱bar* '4', *muy phlaun* '40', *muy s̱lĕ̱k* '400' (Maspero, *op. cit.* pp. 287-8). And, if we accept the Austro-Asiatic hypothesis, we must add to these three systems (quaternary, decimal and vigesimal) a fourth, the quinary system, clearly represented, for example, in Khmer (Maspero, *op. cit.* p. 289)—as in *pràṃ muy* '6'.

Perhaps the most striking thing about the Munda numeral-system is its complexity—quaternary, decimal, vigesimal and (possibly) quinary systems are involved. This complexity stands in marked contrast to the simple decimal

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[1] *See* particularly C. J. Gadd, *Proceedings of the British Academy* 1932 pp. 191-210.

[2] *See* F. Thureau-Dangin, *Esquisse d'une histoire du système sexagésimal.*

[3] According to Grierson (iv, 41) the tendency to count by tens is recent in the Munda languages and is due to the influence of the schools. In Mundari (iv, 85), Kurku (iv, 170), Kharia (iv, 193), Juang (iv, 211) and Savara (iv, 219) the vigesimal system is the only one mentioned for higher numbers by Grierson.

[4] *See* J. Przyluski, *Rocznik Orjentalistyczny* iv, 230-7.

[5] Thus in Santali the numerals run:—*mit'* '1'; *bar, barea* '2'; *p̱e, pea* '3'; *pon, ponea* '4'; *mõr̃ẽ* '5'; *turui* '6'; *eae* '7'; *iral* '8'; *are̱, are* '9'; *g̱el* '10'; *g̱el mit'* '11'; *g̱el bar(ea)* '12'........*mit' isi, bar g̱el* '20'...... *mit' isi g̱el, p̱e g̱el* '30'........*bar isi, pon g̱el* '40' (P. O. Bodding, *A Santali grammar for beginners* p. 20 ff.).

[6] D. F. Carmichael, *A manual of the district of Vizagapatam* p. 371, gives the Gadaba forms *muyi* '1'; *vumbáru* '2',........*vûn, punjá* '4'........*vumbáru punjá* '8'; *vumbáru punjá muyi* '9'.

system of Mohenjo-daro. On the hypothesis that the base-language of the Mohenjo-daro script was Primitive Munda it might well be urged that some of the numeration-systems represented in the Munda of to-day were accretional. But if the rather hopeless task of selecting one numeration-system as the principal numeration-system of Primitive Munda were attempted, the decimal system would assuredly not be the one chosen; what little evidence there is seems to point to a system with a much lower base, the quaternary system. The presence in a language of a principal numeration-system with such a low base is usually taken as indicative of a certain primitiveness of culture and there would be nothing rash in attributing such a culture to the Primitive Munda community.

Under these circumstances it is improbable (but not impossible) that the base-language of the Mohenjo-daro script was Primitive Munda.

In the Burushaski of to-day both a decimal and a yigesimal numeration-system are clearly represented (Lorimer, *op. cit.* §§ 187-8). In his preface to Lorimer's book G. Morgenstierne says "It is tempting to suppose that a'ltʌn, a'lta *two* and a'ltʌmbo *eight*, wa'lto *four* are somehow or other related" (i, XX). This view would suggest the presence of a quaternary system in Burushaski. On the other hand it might be suggested that *a'ltʌmbo*, etc. '8', *hʊnčo*, etc. '9' are subtractive numerals containing as their first elements the words for '1' and '2' (*hin*, *a'ltʌn*, etc.). The presence of either an old quaternary system or a subtractive numeral for 9 (cf. p. 19 above) would render it improbable that the base-language of the Mohenjo-daro script was Primitive Burushaski. The scrap of evidence that there is thus against this possibility.

For Primitive Indonesian we must postulate a pure decimal system with no change-point below 11 (G. Ferrand in A. Meillet and M. Cohen, *Les langues du monde* pp. 431-2).[1] Primitive Indonesian, therefore, might well be the base-language of the Mohenjo-daro script.

Summarising, we may say that it is unlikely that the base-language of the Mohenjo-daro script is Primitive Dravidian, that it is rather unlikely that it is Primitive Munda or Primitive Burushaski, but that it might well be Primitive Indonesian.[2]

SUMMARY.

In the Mohenjo-daro script there are certain signs which bear an obvious similarity to numerals. These 'numeral-signs' do not, in general, represent actual numbers. If their chief use is thus not ideographic there are only two

[1] In various Indonesian languages there are subtractive numerals less than 10 but these all appear to be secondary formations, due, in some cases, to a tendency to avoid tabuised homonyms; cf. Malay *dĕlapan* (earlier *dualapan*) '8' literally '2 taken [from 10]' (: *dua* '2', *alap* 'take'), *sĕmbilan* '9' literally '1 taken [from 10]' (: *sa* 'one', *ambil* 'take') instead of **balu* '8', **si(j)a* '9' (corresponding to Primitive Indonesian **walu*, **siwa*) which were perhaps rejected owing to their homonymy with *balu* 'widow(er)', *sia* 'useless, futile'. Such formations cannot possibly be regarded as *gemeinindonesisch*. On the whole question see a recent paper by Ph. S. van Ronkel, Oostersch Genootschap in Nederland: *Verslag van het 8° Congres gehouden te Leiden op 6-8 Januari 1936* pp. 43-6.

[2] In conclusion I may emphasise the fact that in this étude I have reached the result that the base-language of the Mohenjo-daro script *might well be* Primitive Indonesian; this of course involves no pronouncement on the question whether it actually *is* Primitive Indonesian.

hypotheses :—they may represent (I) words (A) homonymous or (B) quasi-homonymous with the numbers of the base-language of the script or (II) groups of phonemes. If IA is true this base-language must be similar to Modern Chinese in that it possesses a large number of homonyms ; if IB is true it must be similar to Egyptian in that special conditions (*e.g.*, ablaut) leading to the use of quasi-homonyms apply ; if II is true the type of phonematological representation is probably syllabic (not alphabetic) and, further, the numbers in the base-language must have been sufficiently distinct to serve as indicators.

From the non-ideographic use of the numeral-signs for 1, 2, 3, 4, 5, 6, 7, 8, 9, and 12 we conclude that, in the base-language, none of these numbers were 'compounds'. From the systems of weights and measures we know that the chief numeration-system of Mohenjo-daro was decimal.

Four languages (Primitive Dravidian, Primitive Munda, Primitive Burushaski and Primitive Indonesian) are tested against this conclusion and against Hypotheses I and II. The conditions for Hypothesis I are not fulfilled by any of these four languages ; those for Hypothesis II by all of them, but perhaps best by Indonesian. The conclusion as to the numeration-system and the lack of certain 'compound' numerals in the base-language of the script is against the suggestion that this base-language was either Primitive Dravidian, Primitive Munda or Primitive Burushaski ; Primitive Indonesian, however, satisfies the required conditions.

ANANDA TEMPLE, PAGAN.

1.

2.

1.
2. } Dvarapalas.

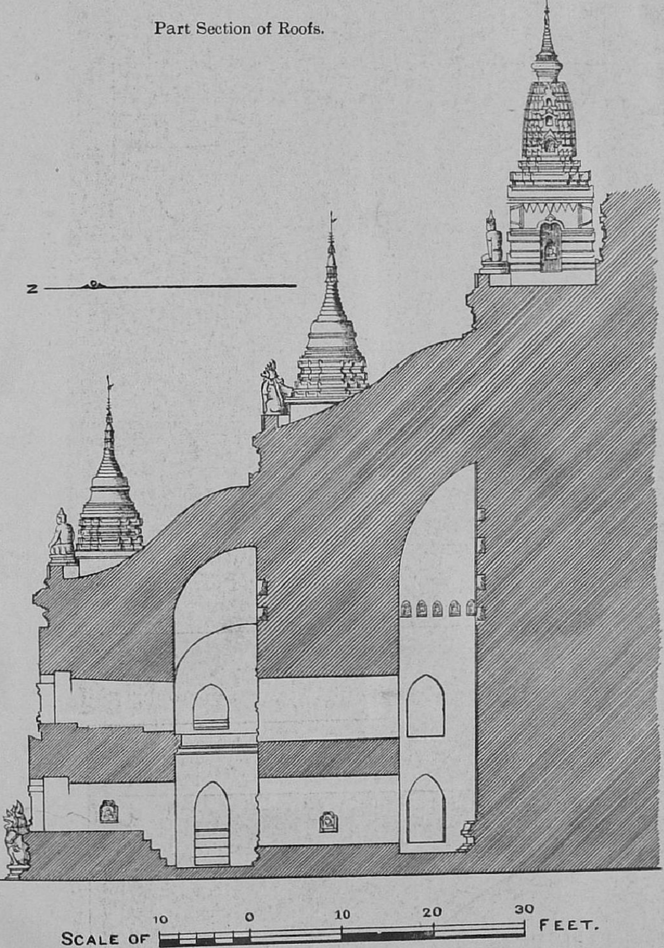
Photo.-Litho. Office, Survey of India.

ANANDA TEMPLE, PAGAN.

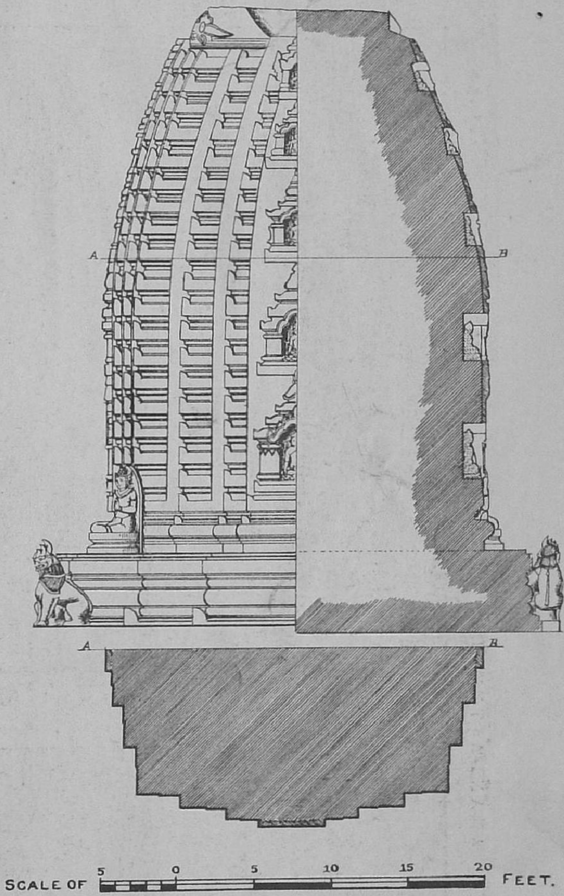
South Porch.

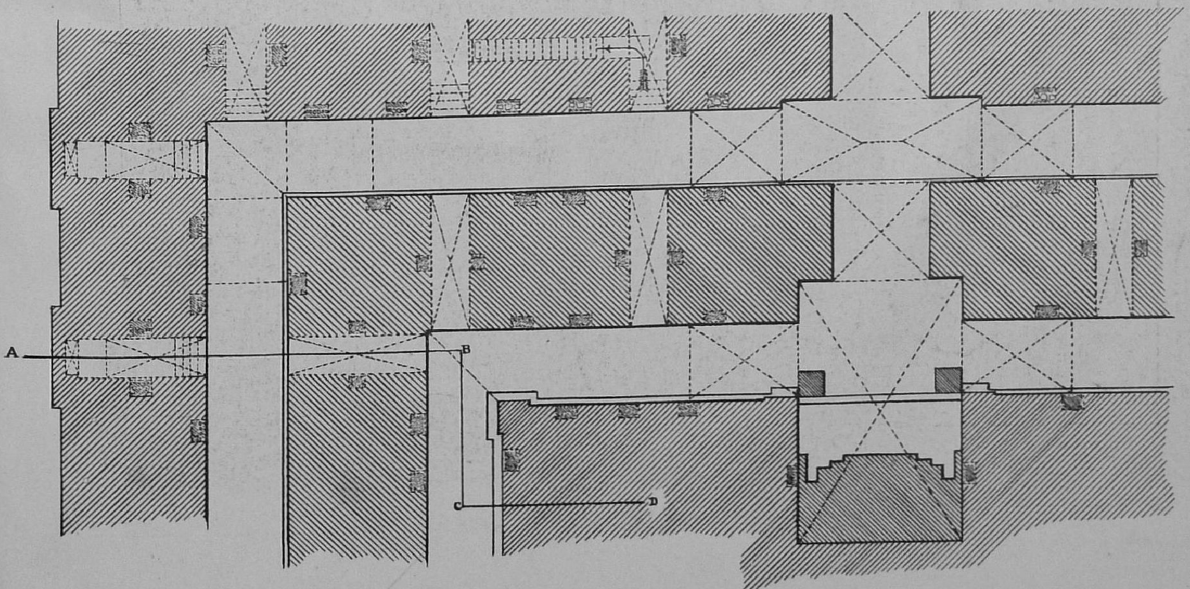
Photo.-Litho. Office, Survey of India.

Part Section of Roofs.

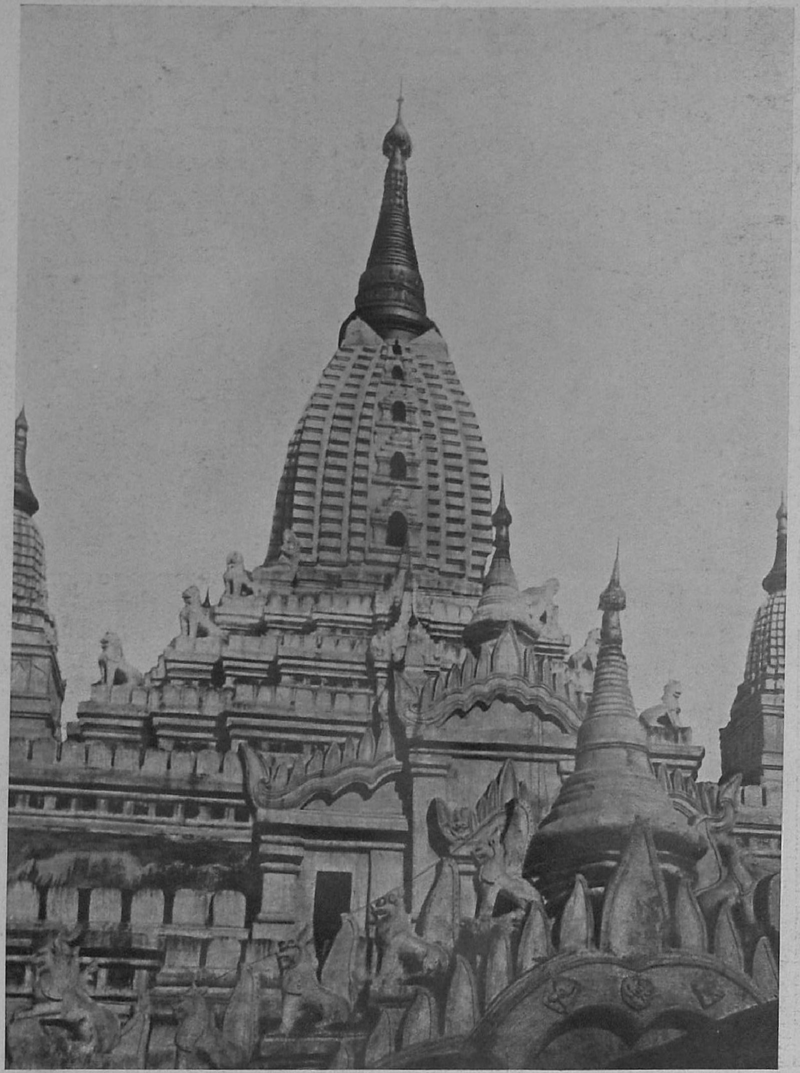


SIKHARA





ANANDA TEMPLE, PAGAN.

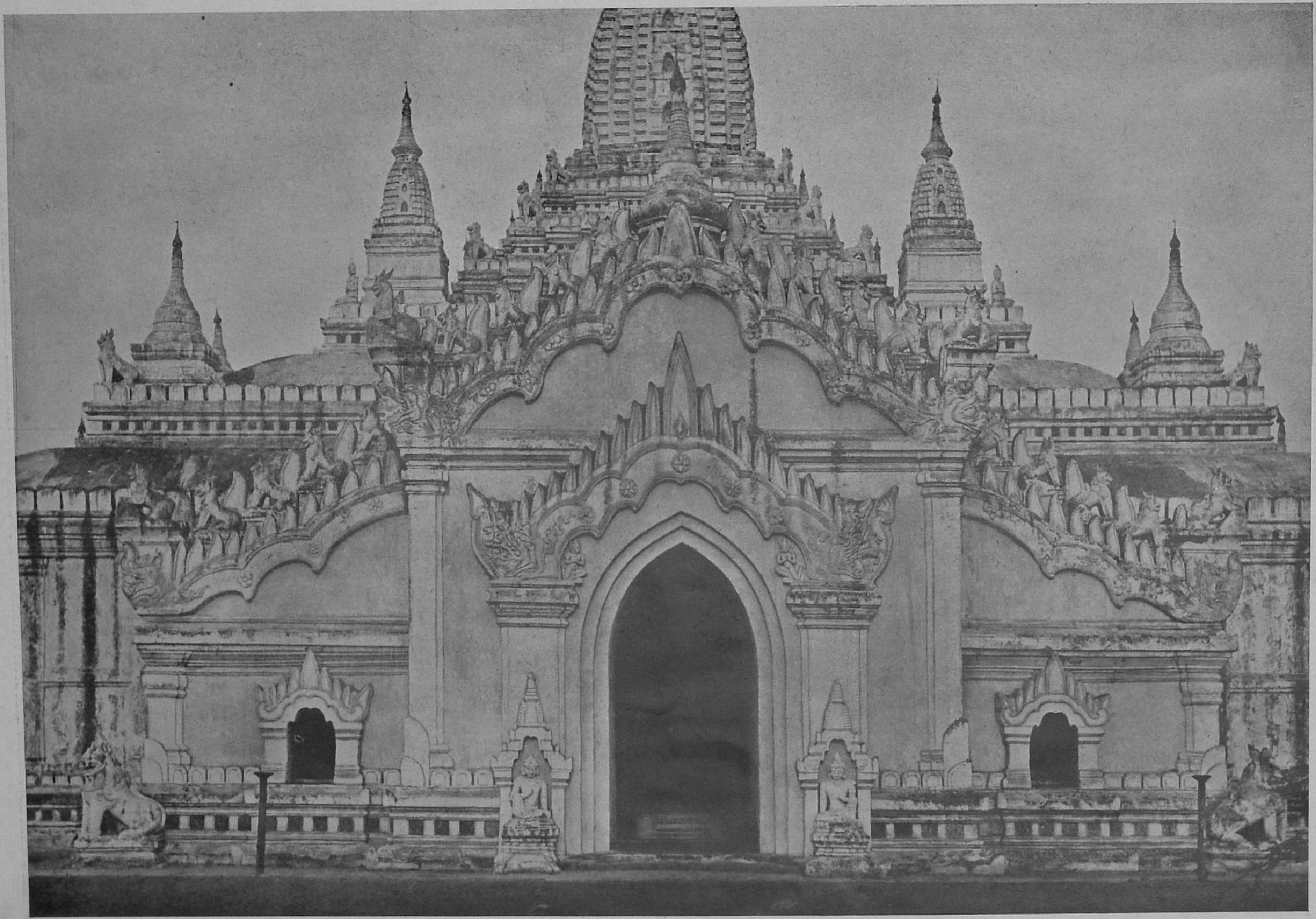


1. The Sikhara and crowning stupa.

2. A gateway.

Photo.-Litho. Office, Survey of India.

ANANDA TEMPLE, PAGAN.



West porch.

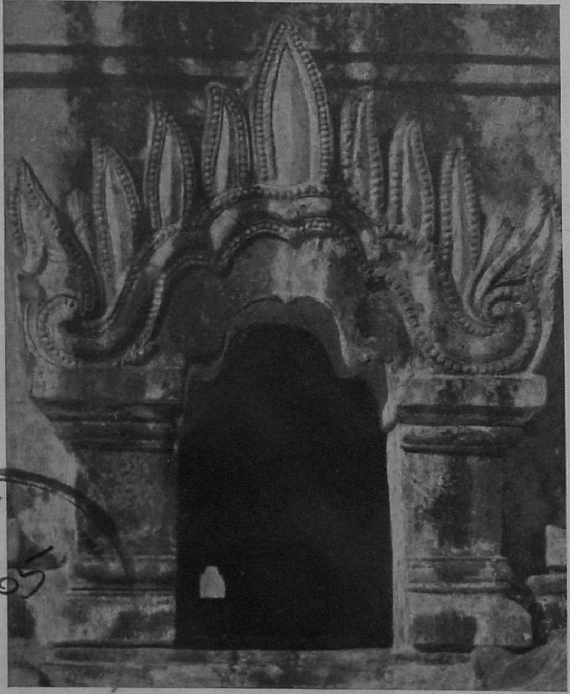
Photo.-Litho. Office. Survey of India.

PLATE XIV.

ANANDA TEMPLE, PAGAN.

1.

2.



3.

4.

1. A dvarapala inside a gateway.

2.
3. Ornamental arches over window-openings.
4.

75005

Photo.-Litho. Office, Survey of India.